ASPARAGUS YIELDS

As Affected By Severity of Cutting

By E. P. Lewis

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RESULTS IN BRIEF

SEVERE CUTTING of asparagus is injurious to both yield and market quality of spears. The injury increases in proportion to the severity of cutting, especially in the early life of the plantation.

Cutting the asparagus bed during the first year after setting was not profitable under the conditions of this experiment. Even Plot 5, which was cut only two weeks the first year, gave lower total yields for the seven-year period than plots which were not cut until the second and third years. More severe cutting caused injury which, from all indications, was permanent. The experimental plantation was of average vigor, but even under very favorable conditions first-year cutting would not be advisable. The lower grade of spears resulting from severe cutting reduces the yearly income from an asparagus plantation.

Light cutting of asparagus the second year and medium cutting the third year gave the highest yield and quality of the six different treatments used in this experiment. Cutting for four weeks the second year after setting reduced the yields. Under conditions of average vigor, such severe cutting would not seem advisable.

If a plantation has made a very poor growth during the first and second years after setting, it may be advisable to delay cutting until the third year or at the most cut very lightly the second year, tho ordinarily there is no need for delaying cutting until the third year.

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Asparagus Yields As Affected By Severity of Cutting

By E. P. Lewis, Associate in Olericulture

ASPARAGUS ranks as one of the important truck crops in Illinois, tho the areas devoted to its production are centralized in a few counties. The value of the crop is greatest in Cook county (Table 1).

In cutting asparagus there are two problems to be considered: (1) the length of cutting season for an established plantation that will give the most satisfactory yields over a period of years; and (2) the most desirable length of cutting season for a new plantation and the age of crowns when cutting should begin. Some growers cut the plantation as long as the market price for asparagus is high, without regard to future yields, while others are more conservative and stop cutting at the end of the normal cutting season. In Illinois the normal cutting season extends over a period of 8 or 9 weeks which, in northern sections, would end about July 4. In a new plantation many growers start cutting the field the second year after setting while others do not start cutting until the third year.

During the summer and early fall the green tops manufacture the food supply, a large proportion of which is translocated to the fleshy storage roots in late fall. This reserve is used to produce the next crop of spears. Shortening the growing period of the tops by excessive cutting would therefore restrict the supply of food that could be stored and consequently would reduce yields the following year.

The experiment reported in this bulletin was conducted at the Cook County Experiment Station maintained by the University of Illinois near Des Plaines, Illinois. The object of the experiment was to determine the effect of severe cutting upon asparagus yields, especially during the early years of the plantation, and to determine the exact age of crowns when cutting should begin.

OTHER EXPERIMENTS

During the past few years, several experiments have been conducted in other states to determine the effect of severe cutting on the yield and quality of asparagus. Most of this work has been along the

TABLE 1.—ACREAGE AND VALUE OF ASPARAGUS CROP IN LEADING ILLINOIS COUNTIES IN 1929[a]

County	Number of acres	Crop value
Union	1 011	$ 98 288
Cook	755	148 353
Madison	516	126 000
Pulaski	492	26 121
Jackson	397	31 437
La Salle	215	42 473
Other counties	1 278	204 256
Total	4 664	$676 928

[a]U. S. Census.

line of extending the normal cutting season of an established plantation. In Iowa, Haber[1] has shown that cutting until July 15, which is approximately two weeks longer than the normal season, reduced the yield and quality of spears. In California, Jones[2] studied the effect of extending the normal cutting season two weeks. Results showed that yields were somewhat reduced even under the conditions of a long growing season.

In regard to the degree of cutting of a new plantation, there is little information. Experiments in California by Jones and Robbins[3] showed that if asparagus made a very vigorous growth the year of setting, it might be cut the following year for a short period without injury. However, in Illinois, where the growing season is shorter, some injury might be expected.

PLAN OF ILLINOIS EXPERIMENT

In the experiment reported in this bulletin, crowns of the Mary Washington variety of asparagus were grown during the season of 1925 and set in the permanent field in the spring of 1926. There were 18 plots, each consisting of a single row 375 feet long with 150 crowns. The rows were 4 feet apart with the crowns spaced at intervals of 2½ feet. The depth of planting was 8 inches.

During the first year, the customary cultivation was given and the furrows gradually filled in around the plants. No fertilizer was ap-

[1]Haber, E. S. Effect of size of crown and length of cutting season on yields of asparagus. Jour. Agr. Res. **45**, 101-109. 1932.

[2]Jones, H. A. Effect of extending the cutting season on the yield of asparagus. Calif. Agr. Exp. Sta. Bul. 535. 1932.

[3]Jones, H. A., and Robbins, W. W. Influence of cutting asparagus the first year after planting on production the following year. Amer. Soc. Hort. Sci. Proc. **23**, 23-25. 1926.

plied the first year. In all subsequent years the plots were disked in the spring and fall, 500 pounds of 4-8-4 fertilizer applied at the end of the cutting season, and ordinary cultivation practised during the cutting season. For three or four weeks after cutting, cultivation was continued and a cover crop of oats was seeded each year about August 1.

The cutting season started approximately May 5 each year and extended for a definite number of weeks according to the outline shown in Table 2. Six different degrees of cutting were made in triplicate.

TABLE 2.—NUMBER OF WEEKS EXPERIMENTAL ASPARAGUS PLOTS WERE CUT EACH YEAR, SIX DEGREES OF SEVERITY BEING REPRESENTED BY THE DIFFERENT SCHEDULES
(Plants set in 1926)

Plots[a]	1927	1928	1929	1930	1931	1932	1933
Cut third year							
1, 7, 13	0	0	4	6	8	8	8
Cut second year							
4, 10, 16	0	2	4	8	8	8	8
2, 8, 14	0	4	6	8	8	8	8
Cut first year							
5, 11, 17	2	4	8	8	8	8	8
3, 9, 15	4	6	8	8	8	8	8
6, 12, 18	6	8	8	8	8	8	8

[a]The plots were arranged in series of triplicates, as indicated here. In all subsequent tables the figures given for each plot are averages of the three replications.

Plots were cut beginning the first, second, and third years after setting and for various lengths of time. Plots were harvested at intervals of one to two days depending on the rapidity of growth. The spears from each plot were graded and records taken as to number and weight for each grade. Three sizes were arbitrarily taken in establishing grades. No. 1 consisted of all spears over ½ inch in diameter, No. 2 from ¼ to ½ inch, and "Strings" under ¼ inch. All measurements were made close to the butt. In spears which were not circular in cross-section the greatest diameter was measured. Weight of spears was recorded on total length as cut and not after trimming.

RESULTS OF DIFFERENT DEGREES OF CUTTING

Long-Time Yields Reduced by Severe Early Cutting

The severe cutting of asparagus during the early life of the plantation reduced subsequent yields, as shown by the figures in Table 3 reporting the yields each year for the entire seven-year period. The

economic returns from the six treatments were lowest where the most severe cutting was done (Table 4).

First-Year Cutting Compared With Third-Year Cutting

Cutting on Plots 5, 3, and 6 was started in 1927 and is designated thruout the discussion as first-year cutting since the plantation was set in 1926. A comparison of yields on these three plots with yields on Plot 1, on which cutting was delayed until the third year, is shown in Table 3 and Fig. 1.

TABLE 3.—YIELDS OF ASPARAGUS DURING SEVEN-YEAR PERIOD
(Each plot consisted of 1/29 acre)[a]

Plot	1927	1928	1929	1930	1931	1932	1933	Total
				Weight of spears				
	lbs.	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*
1	...	.....	10.58	49.97	97.33	158.5	151.5	467.86
4	...	5.90	14.37	72.61	98.83	170.5	169.4	531.53
2	...	12.27	15.47	55.78	80.53	135.8	134.3	434.21
5	2.1	14.13	27.05	48.85	73.95	132.3	133.1	431.51
3	5.7	14.77	20.33	41.87	61.58	108.0	110.8	363.12
6	7.4	16.30	18.37	31.99	52.30	92.7	101.0	320.09
				Number of spears				
1	...	...	383	936	1 508	2 172	2 290	7 289
4	...	212	439	1 310	1 510	2 186	2 393	8 051
2	...	479	562	1 109	1 314	1 899	2 012	7 374
5	91	552	991	1 147	1 371	1 932	2 035	8 119
3	249	667	733	960	1 146	1 642	1 764	7 161
6	355	786	712	811	1 027	1 424	1 626	6 742

[a]Plots were 375 feet long with 150 crowns; rows 4 feet apart; crowns spaced at 2½-foot intervals.

Plots 5, 3, and 6 received respectively, light, medium, and heavy cutting for the first and second years, while Plot 1 had two full years to become established before cutting began (Table 2).

Weight and Number of Spears.—Each of the three plots on which cutting was started the first year (Plots 5, 3, and 6) gave a lower total yield for the seven-year period in weight of spears than Plot 1, which was given two full years to become established (Table 3). Plot 5 gave a greater total number of spears for the seven-year period than Plot 1. Differences in yield, however, are more significant for weight of spears than for number of spears. Furthermore the income from asparagus is more dependent upon weight of crop harvested than on number of spears.

TABLE 4.—GROSS INCOME ON ACRE BASIS, ACCORDING TO GRADE OF ASPARAGUS, FOR SEVEN-YEAR PERIOD FROM PLOTS CUT WITH VARYING DEGREES OF SEVERITY

Plot	Number of crates per acre[a]		Gross income per acre[b]		
	No. 1	No. 2	No. 1	No. 2	Total
1	706	278	$ 948	$311	$1 259
4	825	299	1 105	335	1 440
2	648	265	868	297	1 165
5	611	285	820	319	1 139
3	503	224	674	251	925
6	321	241	430	270	700

[a]The number of crates in each grade are calculated on an acre-basis at a weight of 12 pounds per crate. A 10 percent deduction in weight was made for the butts, which were cut off in trimming for market. Each plot equaled 1/9 acre.

[b]The prices are taken from Chicago South Water Market for 1927-1933: No. 1, $1.34 per crate; and No. 2, $1.12 per crate.

An analysis of Fig. 1 shows the following facts:

1. The number and the weight of spears on all plots for the first two years were in direct proportion to the number of weeks cut.

2. In the third year, Plot 5, which had been cut the lightest of the three plots cut the first year, surpassed Plots 3 and 6, the less severely cut first-year plots, in both number and weight of spears.

3. By the end of the third year, Plots 5, 3, and 6 gave higher total yields for the first three years than Plot 1, which was not cut until the third year. This difference in yields would be expected, of course, since the yields from Plot 1 represent only one year's cutting and the cutting was for a shorter period than on the other plots.

4. Beginning with the fourth year, Plot 3, the medium-cut first-year plot, produced each year a greater number and weight of spears than Plot 6, the most severely cut first-year plot.

5. For the last three years of the experiment Plot 1 gave higher yields than Plots 5, 3, and 6 in both number and weight of spears and a greater total yield in weight for the entire period.

Plot 1 will probably continue to outyield Plots 5, 3, and 6 both in number of spears and in weight of spears per crown, since the yields have run almost parallel during the last three years of the experiment. Altho the differences in favor of third-year cutting do not appear great, more significant differences would result if they were expressed as acre-yields.

It is evident that unless a plantation makes a very vigorous growth, cutting for even a short period the first year after setting is detrimental to yield of spears.

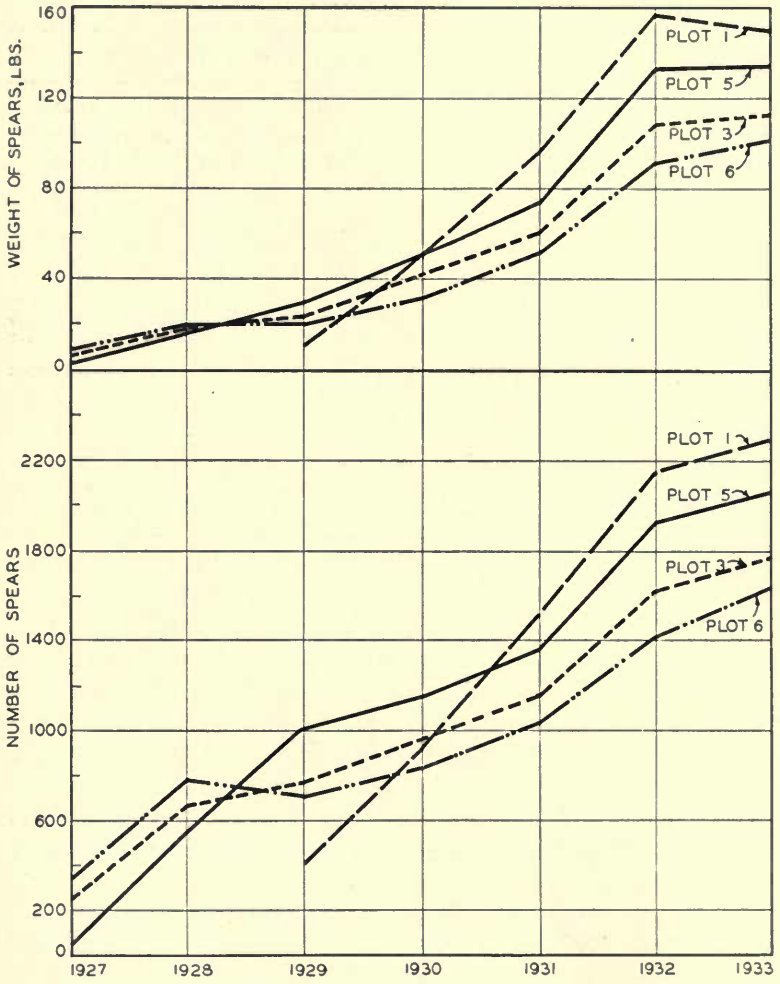

FIG. 1.—EFFECT OF FIRST-YEAR CUTTING ON WEIGHT AND NUMBER OF ASPARAGUS SPEARS, 1927-1933

Of the three plots cut the first year, Plot 5 was given light cutting; Plot 3, medium cutting; and Plot 6, heavy cutting. Plot 1 was not cut until the third year. Both weight of spears and number of spears are in inverse proportion to the number of weeks the plots were cut, except for the first two years. All three plots cut the first year gave lower yields, as measured by weight of spears, over the seven-year period than the plot cut for the first time the third year.

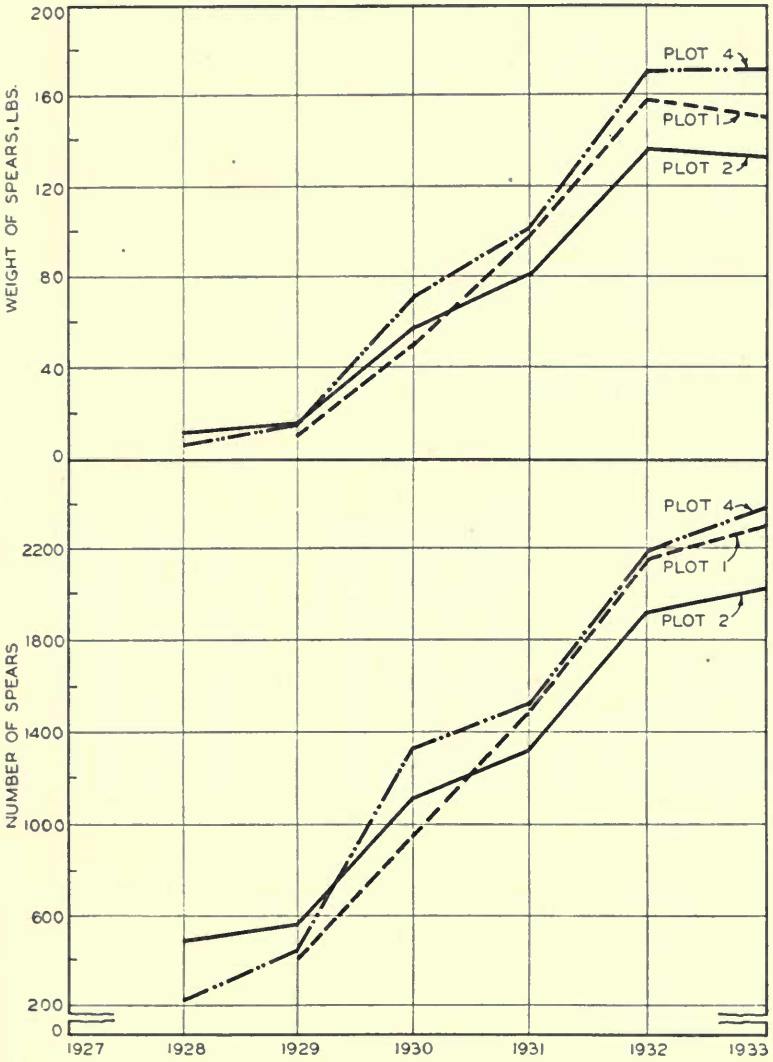

FIG. 2.—EFFECT OF SECOND-YEAR CUTTING ON WEIGHT AND NUMBER OF ASPARAGUS SPEARS, 1927-1933

Plots 2 and 4 were cut for the first time the second year, while Plot 1 was not cut until the third year. Plot 4, which was given lighter cutting than Plot 2, produced the largest yield of spears as measured by weight and the largest number of spears over the seven-year period.

Light Second-Year Cutting Superior to Third-Year Cutting

The effects of starting the cutting of an asparagus plantation the second year after setting as compared with the third year are shown in Table 3 and Fig. 2.

Cutting on Plots 2 and 4 started in 1928 and is designated thruout the discussion as second-year cutting. Plot 1 was not cut until the third year after setting (Table 2).

Weight and Number of Spears.—The plots most severely cut during the second and third years showed a permanent reduction in yield, as measured by both weight of spears and number of spears, compared with the plots cut more lightly during these years (Table 3 and Fig. 2).

The weight of spears cut from Plot 2, which was cut heavier than Plots 1 and 4, was less after the fifth season than the weight of spears from either of the other two plots. Tho a higher number of spears was cut from Plot 2 than from Plots 1 and 4 for the first three years, owing to the longer period of cutting, after the third year Plots 1 and 4 produced the highest yields.

Plot 4, which was cut for only 2 weeks the second year, yielded a heavier total weight of spears and a larger total number than Plots 1 and 2 for all seven years of the experiment. Plot 1, on which cutting was delayed until the third year, gave a lower number of spears than either of the second-year cutting plots until after the fourth year of the experiment, when it exceeded Plot 2.

An analysis of the total seven-year yields in pounds per plot shows that Plot 4, which received light second-year cutting, gave an increase of 22-percent over Plot 2, which received a heavy second-year cutting, and a 13-percent increase over Plot 1, which was not cut at all until the third year.

Quality of Spears Reduced by Severe Cutting

The market quality of all spears was influenced to a great extent by the various degrees of severity of cutting during the early life of the asparagus plantation. The size of spears, as indicated by individual weight and by diameter, decreased in direct proportion to the severity of cutting (Table 5 and Fig. 3). The figures represent the average performance of the six treatments for the seven-year period.

All plots cut the first year (Plots 5, 3, and 6) gave the smallest proportion of No. 1 spears and the largest proportion of the lower grades. Heavy second-year cutting (Plot 2) gave lower quality of spears than third-year cutting (Plot 1); while light second-year cutting (Plot 4) gave higher quality than third-year cutting (Plot 1).

TABLE 5.—EFFECT OF VARIOUS DEGREES OF CUTTING UPON MARKET QUALITY OF SPEARS HARVESTED DURING SEVEN-YEAR PERIOD[a]

Plot	Percent of total spears in each grade						Average weight per spear	Average diameter of spears
	Based on number			Based on weight				
	No. 1	No. 2	Strings	No. 1	No. 2	Strings		
							gms.	*1/16 inch*
1	45.8	39.6	14.6	69.6	27.4	3.0	29	7.28
4	48.7	39.1	12.2	71.8	25.7	2.5	30	6.96
2	42.8	41.4	15.8	68.8	28.1	3.1	27	6.51
5	38.7	41.9	19.4	65.4	30.4	4.2	24	6.31
3	38.0	41.6	20.4	64.0	31.1	4.9	23	6.05
6	35.9	44.5	19.6	60.6	34.6	4.8	22	5.76

[a]During the first two years all spears were measured, while during the last three years, a representative sample consisting of half the spears was measured on alternate harvest days.

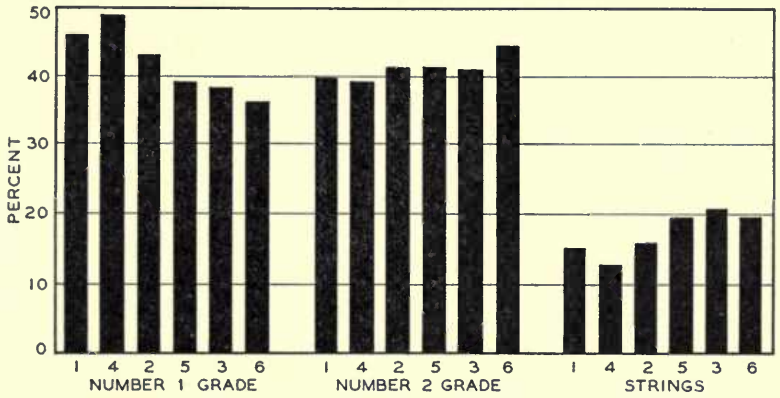

FIG. 3.—EFFECT OF DEGREE OF CUTTING ON NUMBER OF SPEARS IN EACH GRADE

Severe cutting of asparagus early in the life of the plantation reduced the quality of spears as measured by grade. The six plots are arranged in the above graph in order of increasing severity of cutting. The percentage of No. 1 spears decreased with more severe cutting while the percentage of the two lower grades increased.

Growth of Tops Permanently Stunted by Severe Cutting

Prolonging the cutting season of asparagus, since it lessens the growing period of the tops and thus restricts the food supply that is manufactured in the top and stored in the fleshy roots, tends to reduce the yield the following season. In order to insure high yields of asparagus, a full growing season is necessary.

The effects of severe cutting upon the growth of tops were determined by growth records and measurements taken in September, 1929, the third year of the experiment, and early in October, 1933, the seventh year (Table 6). Every third crown in each plot was taken as a representative sample. Each stalk was measured just above the

TABLE 6.—EFFECT OF VARIOUS DEGREES OF CUTTING UPON GROWTH OF TOPS

Plot	Height of stalk			Average diameter of stalks			Average number of stalks per crown		
	1929	1933	Aver.	1929	1933	Aver.	1929	1933	Aver.
	inches	*inches*	*inches*	*1/16 inch*	*1/16 inch*	*1/16 inch*			
1.....	49.8	58.7	54.3	5.13	6.70	5.93	6.9	9.8	8.35
4.....	51.5	59.8	55.6	6.28	7.10	6.69	5.7	9.6	7.63
2.....	49.2	58.3	53.8	5.17	7.00	6.09	6.0	8.6	7.27
5.....	45.3	59.5	52.4	5.25	7.20	6.21	4.7	8.3	6.50
3.....	47.0	57.5	52.2	4.85	6.80	5.84	5.3	8.3	6.80
6.....	42.9	57.5	50.2	4.90	6.80	5.87	4.6	8.5	6.55

ground. Stalks, which were somewhat oval in cross-section, were measured thru the smallest diameter. Growth records showed that severe cutting restricted the growth of tops in 1929. The height of stalk, the number of stalks per crown, and average diameter of stalks were reduced somewhat in proportion to the severity of cutting. The results in 1933 were quite similar in that the most severe cutting during the early years of the plantation still showed up in reduced vigor of tops.

The 1929 results indicate that severe cutting during the first three years of growth of an asparagus plantation retards the growth of tops at the end of the third year; the records of 1933 show that this stunting is permanent.